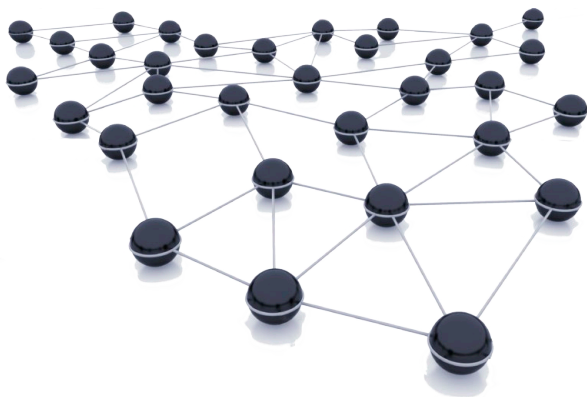


Wasp mote Plug & Sense!

User Manual



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1. Introduction

The aim of this manual is to introduce the user to WaspMote Plug & Sense! in a practical way.

This document applies to the following WaspMote Plug & Sense! models, approved for FCC and IC:

Model	FCC ID	IC
WaspMote Plug & Sense! 802.15.4	XKM-WPS-2400-V1	8472A-WPS2400V1
WaspMote Plug & Sense! 900 US	XKM-WPS-900-V1	8472A-WPS900V1
WaspMote Plug & Sense! WiFi	XKM-WPS-WIFI-V1	8472A-WPSWIFIV1
WaspMote Plug & Sense! 4G US	XKM-WPS-4G-V1	8472A-WPS4GV1
WaspMote Plug & Sense! LoRaWAN US	XKM-WPS-LORA-V1	8472A-WPSLORAV1
WaspMote Plug & Sense! Sigfox US	XKM-WPS-SFX-V1	8472A-WPSSFV1

2. General and safety information

Software:

- Upload code only using WaspMote IDE. If a different IDE is used, WaspMote can be damaged and can become unresponsive. This use is not covered under warranty.
- Do not unplug any connector while uploading code. WaspMote can become unresponsive. This use is not covered under warranty.
- Do not connect or disconnect any connector while WaspMote is ON. WaspMote can become unstable or unresponsive, and internal parts can be damaged. This fact is not covered under warranty.

Hardware:

- Do not handle black stickers seals on both sides of the enclosure (Warranty stickers). Their integrity is the proof that WaspMote Plug & Sense! has not been opened. If they have been handled, damaged or broken, the warranty is void.
- Do not open WaspMote Plug & Sense! in any case. This will automatically make the warranty void.
- Do not handle the four metallic screws of WaspMote Plug & Sense!. They ensure waterproof seal.
- Do not submerge WaspMote Plug & Sense! in liquids.
- Do not place nodes on places or equipment where it could be exposed to shocks and/or big vibrations.
- Do not expose WaspMote Plug & Sense! to temperatures below -10°C or above 50°C.
- Do not try to extract, screw, break or move WaspMote Plug & Sense! connectors far from necessary usage, waterproof sealing can be damaged and warranty will be voided. For more information: <http://www.libelium.com>
- Do not connect any sensor not provided by Libelium.
- Do not place WaspMote Plug & Sense! where water can reach internal parts of sensors.

3. Waspmote Plug & Sense!'s Hardware Setup

Here we show the most basic points about the hardware configuration:

3.1. ON/OFF Button

This button is used to turn ON or OFF Waspmote. It is a latch type button with two static positions as shown below. In ON position, the button remains a bit lower than LED ring.



Figure : On / Off button at off position



Figure : Turning On Waspmote

3.2. External LED

ON / OFF button includes a red ring led, which can be managed by software. This led can be used for instance to know that Wasmote is ON, or for debugging purposes at developing phase. By default, Wasmote Plug & Sense! comes with a code that blinks briefly (3 times in less than one second) this led when it is turned ON. The LED can be managed specifying ON time or just setting this state with specific API functions. The user should take into account that the usage of this led will increase power consumption due to external LED consumes 4.4 mA.



Figure : Wasmote turned On

3.3. Resetting Wasmote Plug & Sense! with an external magnet

Wasmote Plug & Sense! it can be reset with an external magnet, with no contact. If one node stops working or if a defective behavior is detected, it would be costly to uninstall the node to bring it back to laboratory. This feature allows the network manager to reset the node in a quick and easy way.

The hardware consists of a reed switch connected to the Wasmote reset line. When the user gets the magnet close to the reed-switch, the reset is activated. When the user moves the magnet away, the reset line is released (the external LED will blink) and Wasmote executes the bootloader first and then, the setup function. After the setup, it will continue with the loop function. Next pictures shows the right way to reset the node using an external magnet, first moving it closer, and then moving it away.



Figure : Moving the magnet closer to the node.

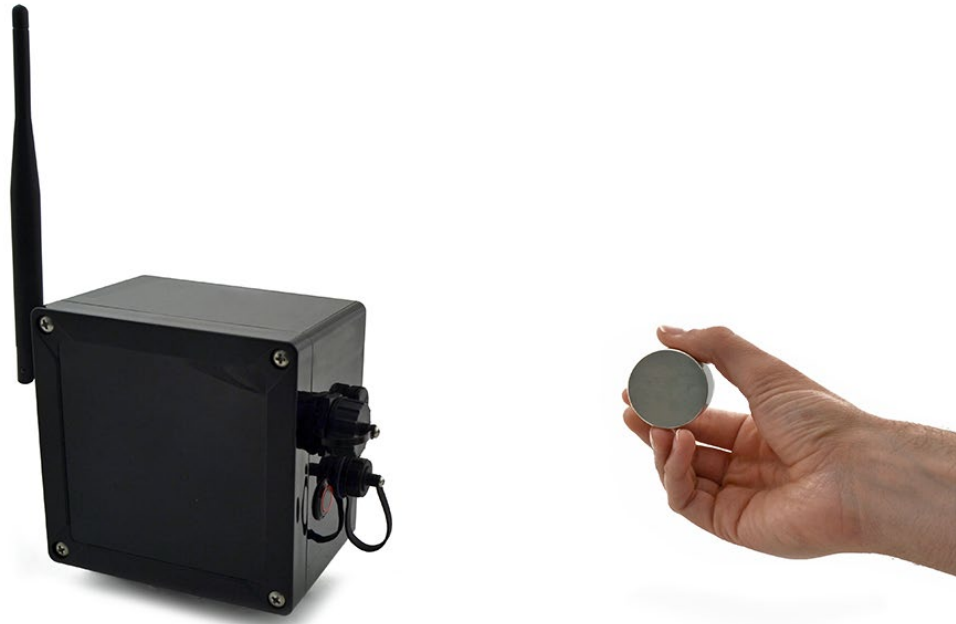


Figure : Moving the magnet away from the node.

The magnet is made of neodymium. It is a special, high-power magnet. We only advise to use the magnet Libelium provides.

It is not mandatory, but highly recommended to consider this feature when designing the project. The user should design the software in a way the node can be reset if things go wrong. Remember that laboratory tests are always needed to validate the feature before your final deployment.

When the node is already deployed in the field, and for instance it is installed in a traffic light, this feature can be used to reset the node easily, as it is shown in the diagram below, where a technician uses a pole with the magnet attached in one side.

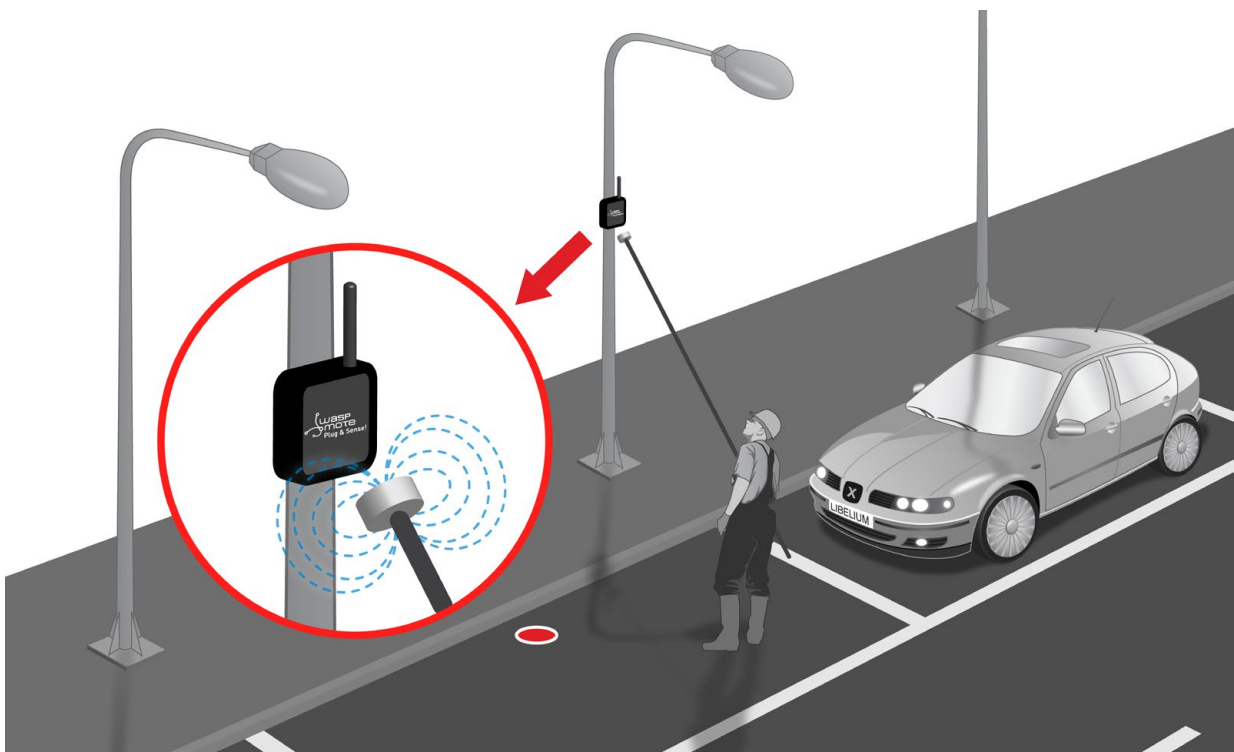


Figure : Applying the magnet in a real deployment

3.4. USB

This connector is used to upload code into Waspmote with a male to male USB cable provided by Libelium. Just connect one side of the cable to this connector, removing protection cap and connect the other side to a PC to upload a code. Next picture shows an example.



Figure : USB connector and protective cap



Figure : Connecting the USB cable to Waspmote

When uploading processes are finished, do not forget to screw firmly the protection cap to avoid connector damage.

3.4.1. External SIM socket

The External SIM socket replaces the USB socket in two devices:

- Waspote Plug & Sense! 4G
- Meshlium

The External SIM socket is composed of 2 connectors:

- micro-SIM card
- micro-USB (type B)



Figure : External SIM socket in a Plug & Sense! 4G

The operation with the micro-USB socket is just the same than with the normal USB socket. Just remember to use a micro-USB cable.



Figure : Connecting the micro-USB cable to Plug & Sense! 4G

The micro-SIM card connector allows the user to connect the SIM card he likes from the outside. You can ask your telecommunication provider for a micro-SIM card. Alternatively you can take a normal SIM card and transform it into a micro-SIM card with a SIM card cutter.

Besides, the micro-SIM card connector has a push-pull mechanism, so it is really easy to remove the card with the aid of one nail.

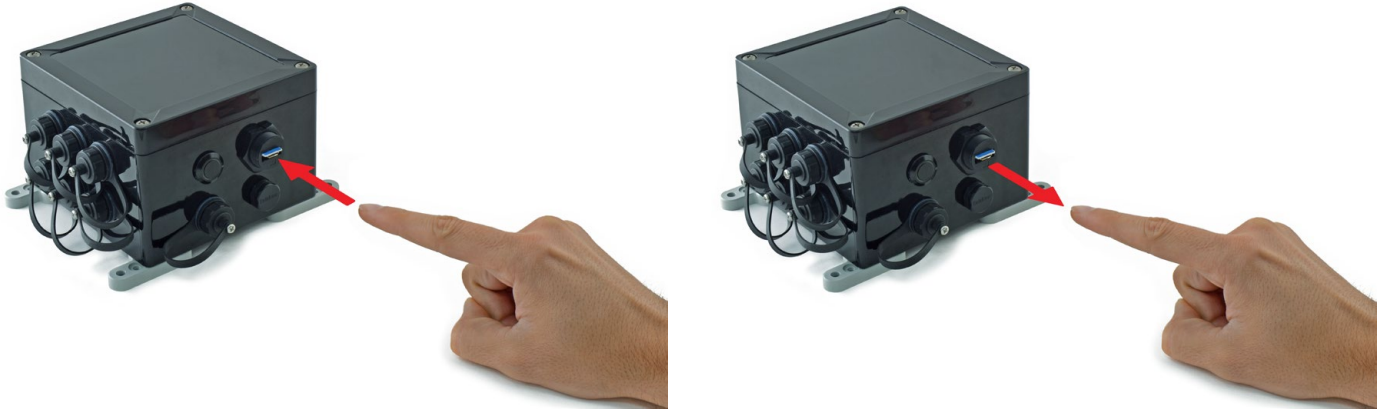


Figure : Push-pull mechanism in the External SIM socket

It is highly important to turn off the Plug & Sense! device in a secure way before inserting a micro-SIM card, or removing an existing SIM-card. The user can damage the device if this operation is done "on-the-fly".

Make sure you closed the External SIM socket with its protection cap before outdoors deployment.

Take into account that the External SIM socket has a limited resistance so please be gentle and do not push too hard with the USB or SIM card.



Figure : Inserting a SIM card with care in the External SIM socket

3.5. Antenna

By default Waspote Plug & Sense! has one external antenna with a standard reverse polarized SMA connector. This connector allows to connect the RF antenna.



Figure : Antenna connector of the enclosure

To ensure good RF coverage, be sure antenna points to the sky and also be sure antenna is screwed completely to the connector. To connect the antenna, just align it with the connector and screw it carefully. Antenna must be connected in order to ensure RF communication.



Figure : Connecting antenna to the enclosure

Note: Once Waspote Plug & Sense! is installed, it is recommended to fix it using a tape like the one shown in the picture below.



Figure : Recommended tape



Figure : Ensure antenna remains in the right position

Do not try to connect other kind of antennas which do not match with SMA RP standard connector and also other antennas not provided by Libelium.

Waspote Plug & Sense! 4G is a special case because it has 3 connectors for 3 antennas:

- Cellular communications (main)
- Cellular communications (receiver diversity, secondary antenna)
- GPS signal receiver

The 3 antennas are just the same model. You can see how to connect the 3 antennas in the following figure:



Figure : The 3 antennas of Waspote Plug & Sense! 4G

4. Wasp mote IDE: Download and Installation

The first step is to install the Wasp mote IDE (Integrated Development Environment).

This IDE can be found on:

http://www.libelium.com/development/plug_&_sense/sdk_and_applications

The Wasp mote IDE is based on the open source Arduino platform compiler, following the same style of libraries and operation. It is important to use the version found on **Libelium website** and no other version of Arduino IDE. This is because the version available on the Libelium website has been properly tested and for which we can assure optimum operation.

5. Compiling a New Program

To use the Waspnote IDE compiler we must run the executable script called 'Waspnote', which is in the folder where the compiler has been installed.

Waspnote IDE is divided into 4 main parts which can be seen in the following figure.

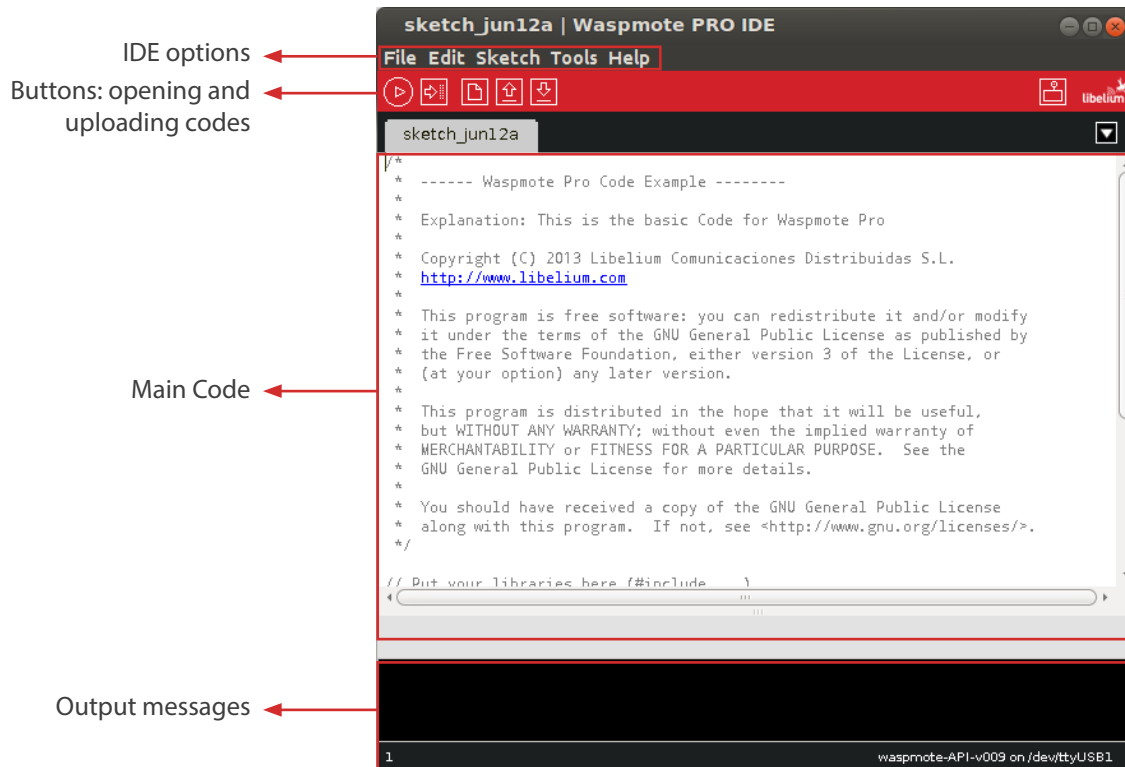


Figure : IDE – Waspnote parts

- The first part is the menu which allows configuration of general parameters such as the selected serial port.
- The second part is a button menu which allows compilation, opening, saving or loading the selected code on the board.
- The third part contains the main code which will load in Waspnote and the fourth part shows us the possible compilation and load errors, as well as the success messages if the process is carried out correctly.

The Waspnote IDE buttons panel allows certain functions to be carried out such as opening a previously saved code, creating a new one or loading the code on the board. The following figure shows the panel and the functions of each button.

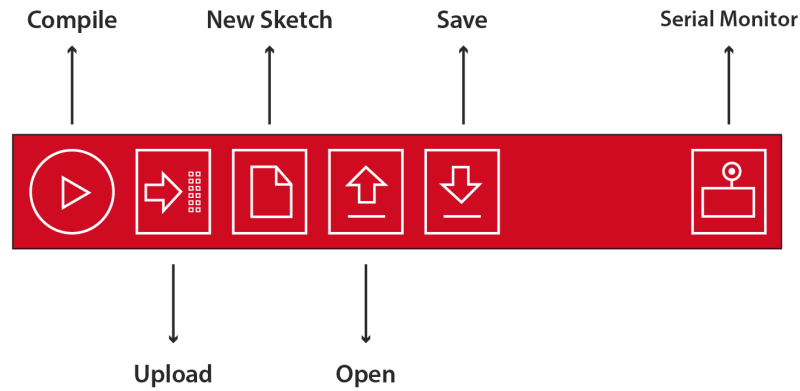


Figure : IDE – Waspmote panel of buttons

The next step is to configure the folder where the created programs are going to be saved. In the Waspmote IDE, this folder is called 'sketchbook' and can be configured by accessing the 'File/Preferences' tab. Clicking on this tab will open a new window where the location of the sketchbook can be indicated. Once the sketchbook folder path is indicated, the downloaded test program must be saved in this folder.

Waspmote IDE must be closed so that the changes and the newly saved program in the sketchbook folder are reflected.

6. Uploading a New Program to Wasmote Plug & Sense!

Using the USB connector, a new code can be uploaded to Wasmote without opening Wasmote Plug & Sense!. Just connect one side of the USB cable to this connector, removing protection cap if necessary and connect the other side to a PC. Remember that Wasmote must be ON to allow uploading a new code. Next steps describe this process in detail.

Step 1: Open the USB connector

Remove the protection cap of the USB connector.



Figure : Removing the USB cap

** In the case you have a Plug & Sense! 4G, insert your micro-SIM card in the External SIM socket with care.*



Figure : Inserting a SIM card with care in the External SIM socket

Step 2: Connect the USB cable to Waspote Plug & Sense!

Connect one side of the male-to-male USB cable to the USB connector. For models with 4G, use a micro-USB cable.



Figure : Connecting the USB cable to Waspote Plug & Sense!

Step 3: Connect the USB cable to the PC

Connect the other side of the USB cable to your PC.



Figure : Connecting the node to a PC

Step 4: Turn On Waspmote Plug & Sense!

Be sure you have turned ON the node by pressing ON/OFF button.



Figure : Turning ON Waspmote

Step 5: Open Waspmote IDE

Now open Waspmote IDE. If you do not have Waspmote IDE already installed in your PC, then go to the **Development section** of Libelium website to download it.

Step 6: Select the corresponding code

Build your own code for your model using the online **Code Generator** (http://www.libelium.com/development/waspmote/code_generator) provided by Libelium at the **Development section** of Libelium website (see corresponding section for details about how to use the code generator). Download and open it in Wasmote IDE Plug & Sense!.

Save the sketch (Wasmote IDE has a button for that), for example with the name “Wasmote_Plug_Sense_test_code”, and check the IDE message “Done Saving”

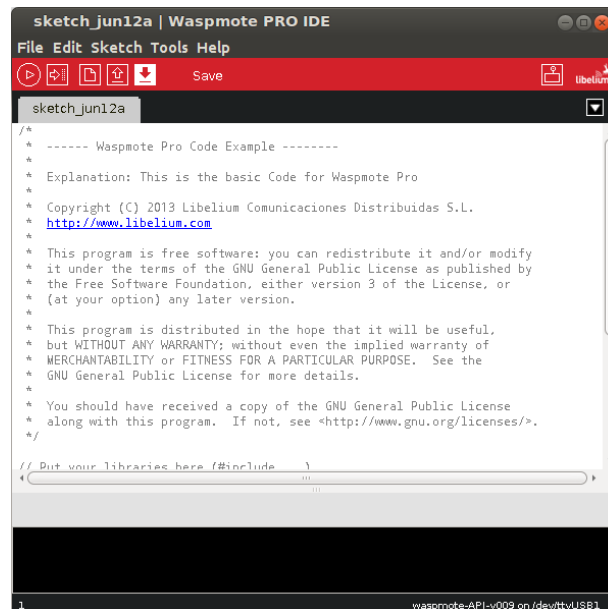


Figure : Preparing code for Wasmote Plug & Sense!

Step 7: Select the corresponding API

Select the API version corresponding to Wasmote Plug & Sense! going to tools/board. If you do not have the API for Wasmote Plug & Sense!, please go to the **Development section** of Libelium website and download it.



Figure : Selecting API for Wasmote Plug & Sense!

Step 8: Select the USB port

Select the corresponding serial port by going to tools/serial port. If you are unable to see the proper USB port maybe you should install the latest FTDI drivers on your PC.

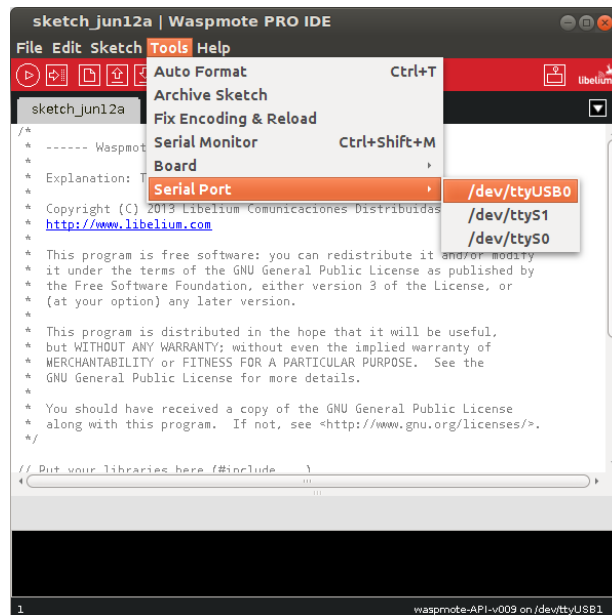


Figure : Selecting the USB port for Waspmote Plug & Sense!

Note: the name of the USB ports depends on the OS and the particular PC you have. The best way to find the USB where Waspmote is connected is trial & error.

Step 9: Compile the code

Compile the code (the IDE has a button for that), and check there are no errors or warnings. The IDE should say "Done Compiling".

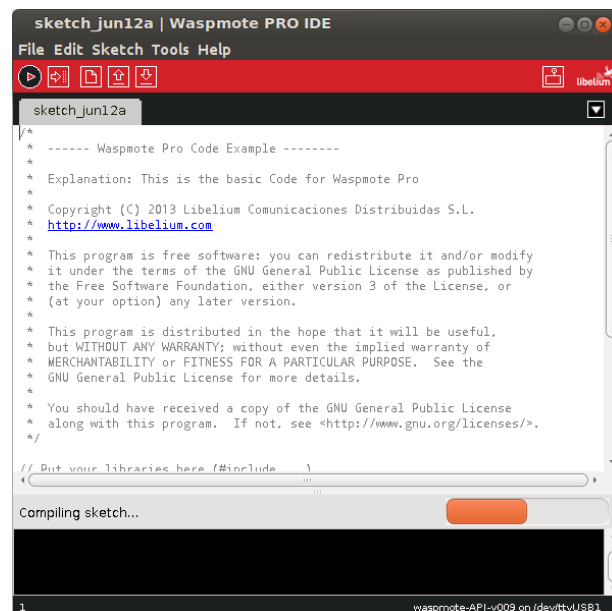


Figure : Compiling a code for Waspmote Plug & Sense!

Step 10: Upload the code

Now, press the upload button and see messages coming out from IDE. During a while you will see message “uploading to I/O board”.



Figure : Uploading a code for WaspMote Plug & Sense!

Wait a few seconds until the process ends and check there are no error messages, just “Done uploading” message.

Step 11: Open the Serial Monitor

If uploading processes are successfully completed, open Serial Monitor to see the output of the uploaded code.

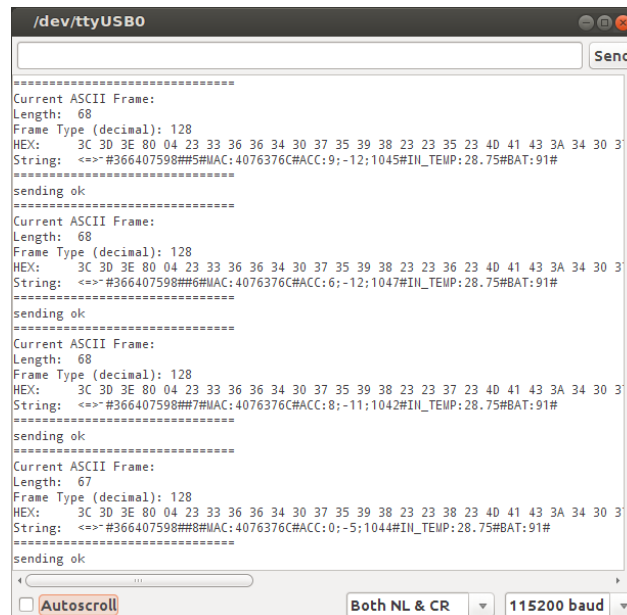


Figure : Opening WaspMote IDE serial monitor

When uploading processes are finished successfully, do not forget to screw the protection cap of USB connector to avoid its damage.

7. Certifications information

This document applies to the following Waspote Plug & Sense! models, approved for FCC and IC:

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Waspote Plug & Sense! 802.15.4	XKM-WPS-2400-V1	8472A-WPS2400V1
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Waspote Plug & Sense! WiFi	XKM-WPS-WIFI-V1	8472A-WPSWIFIV1
Waspote Plug & Sense! 4G US	XKM-WPS-4G-V1	8472A-WPS4GV1
Waspote Plug & Sense! LoRaWAN US	XKM-WPS-LORA-V1	8472A-WPSLORAV1
Waspote Plug & Sense! Sigfox US	XKM-WPS-SFX-V1	8472A-WPSSFXV1

7.1. USA and Canada certification

Modification statement

Libelium has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Interference statement

This device complies with Part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Wireless notice

This device complies with FCC/ISED radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the ISED radio frequency (RF) Exposure rules. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

For FCC Part 15 – Class B device: digital device or peripheral

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Modification statement

Libelium n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

Interference statement

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Wireless notice

Le présent appareil est conforme à l'exposition aux radiations FCC / ISED définies pour un environnement non contrôlé et répond aux directives d'exposition de la fréquence de la FCC radiofréquence (RF) et RSS-102 de la fréquence radio (RF) ISED règles d'exposition. L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.

CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne NMB-003.